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has resulted in the exhaustive exploration of the hitherto doubtful ultra-violet region between 231.4 and 185.2$\mu\mu$ and the annexation of the region down to 100$\mu\mu$ to the known spectrum. For this it was necessary to get rid of the absorption due to the film of gelatine in which the sensitive silver salt was imbedded, and this was accomplished by the substitution of a pure silver bromide plate. The camera, the spectroscopic apparatus and the spark tube were all connected together and exhausted. The very first exposure on the hydrogen spectrum showed that the known radiations of that gas only represent a portion of its total radiance. The newly-traced portion turned out to be extremely rich in lines, with a maximum at about 162$\mu\mu$, and consisted of fifteen groups of lines disposed pretty evenly, containing altogether about 600 lines, with intensities decreasing from the maximum in both directions, rapidly at first and then very gradually. The wave-lengths of these lines are as yet undetermined. Provisionally, that of the smallest wave-length recorded is estimated at 100$\mu\mu$. The spectra of aluminium, cadmium, cobalt and other metals end at about 170$\mu\mu$. A layer of normal air 1^{mm} in thickness appears capable of absorbing all radiation of smaller wave-length than that. Dry gelatine absorbs eagerly all wave-lengths beyond 217$\mu\mu$. Quartz is not suitable for prisms and lenses, and white fluor-spar is, so far, the only material that answers all requirements. The accurate determination of the new wave-lengths, the further investigation of the absorption due to air and the further extension of the ultra-violet region are the problems which Herr SCHUMANN is now working at."—Extract from *Nature* of January 11, 1894.

THEORY OF PHOTOGRAPHIC PHOTOMETRY.

In the *Monthly Notices* of the Royal Astronomical Society (Vol. 54, page 65), Captain ABNEY gives the results of his recent experiments in photographic photometry. Many experiments before 1889 had led Captain ABNEY to the conclusion (*Report* B. A. A. S., 1889, P. 487), that "for any ordinary light, intensity and exposure are interchangeable" except when the light is very feeble. The same conclusion is stated in *Nature*, October 10, 1889, page 584, as follows: "The deposit of silver made by different intensities of light varies directly as the intensity of light acting—this, of course, within such limits that reversal of the image is not commenced and that the film is not at any part exhausted of the silver salt that can be reduced." All our experiments at the Lick Observatory since 1888 have led to a different conclusion.[*]

It is, therefore, very gratifying to us that Captain Abney's experiments confirm our own. His conclusions are that the chemical action is *not*, generally, proportional to the exposure for a constant light (on bromide plates); or, to take a special case, that "*the sum of a large number of small* (short) *exposures was not equal to the same exposure given at one time.*" These conclusions have an important bearing on the theory of photographic photometry in general and on the practical matter of determining the magnitudes of stars by measures of their images on negative plates in particular.

E. S. H.

The System of 61 *Cygni.*

Dr. Wilsing of Potsdam has recently announced to the Berlin Academy of Sciences that he has detected a periodic variation of the distance between the two bright components of the star 61 *Cygni.* In the process of reducing several hundred photographic observations, taken in 1890–93 for determining the parallax of this star (one of the nearest to our system), he found that the distance between the two components varied from 20″.8 to 21″.1 and back to 20″.8 in about twenty-two months. He is inclined to attribute this relative motion to the presence in that system of one or more bodies which cannot be seen with our large telescopes.

W. W. C.

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[*] E. S. Holden, in *Bulletin Congrès Astrophotographique*, Vol. I, page 297, August 15, 1889, and Lick Observatory Reports on the Eclipses of January and of December, 1889. S. W. Burnham, in Lick Observatory Report of the Eclipse of December, 1889, pages 8 and 35. J. M. Schaeberlk, *op. cit.*, page 35; and Terrestrial Atmospheric Absorption of the Photographic Rays of Light, page 3, equation (1). A. O. Leuschner, in *Publications* A. S. P., Vol. II, page 7 (see especially page 9 and the paragraph in italics, page 14).